

No. 709,062.

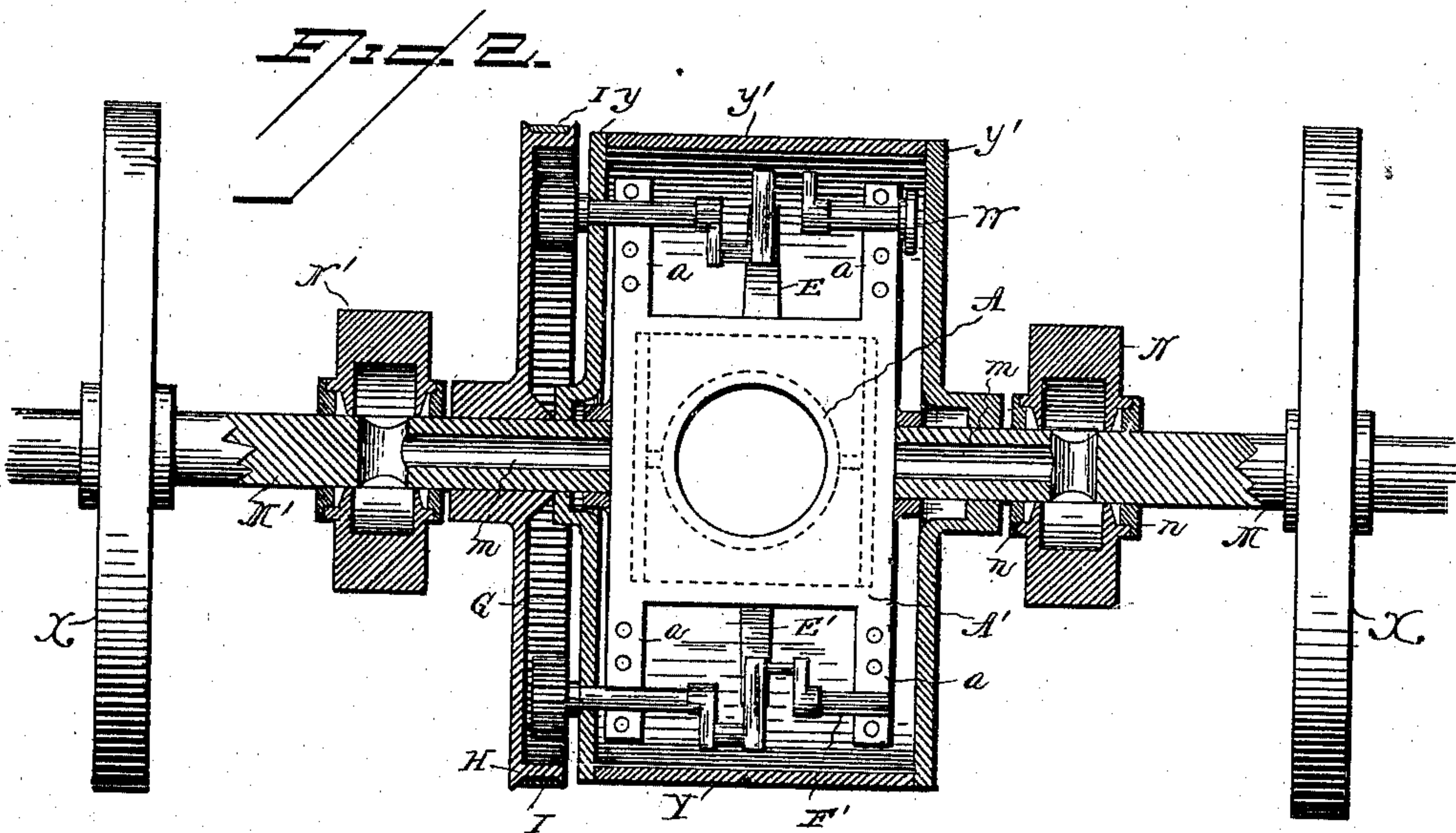
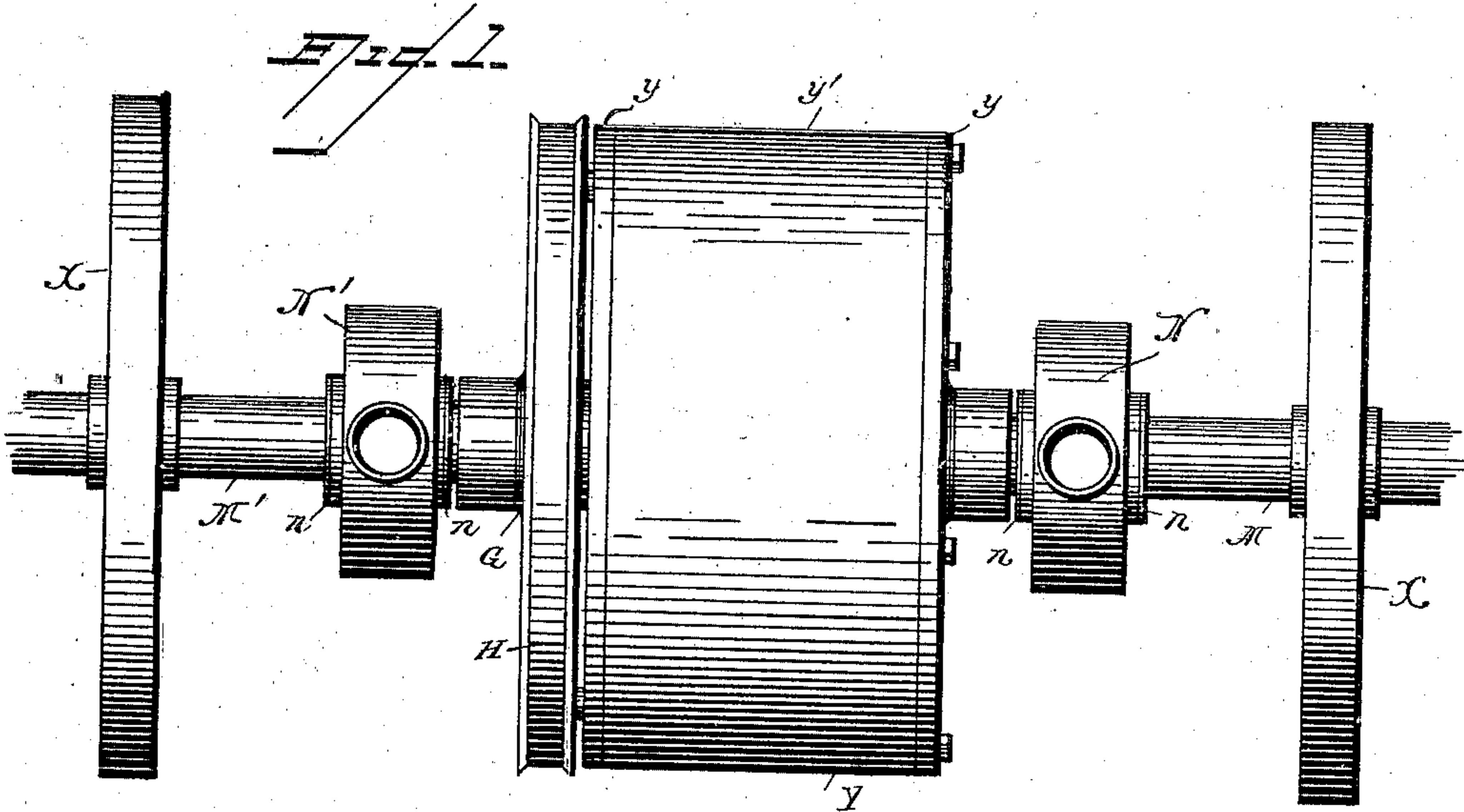
Patented Sept. 16, 1902.

N. J. VERRET & H. N. SAMSTAG.
STEAM ENGINE.

(Application filed Aug. 10, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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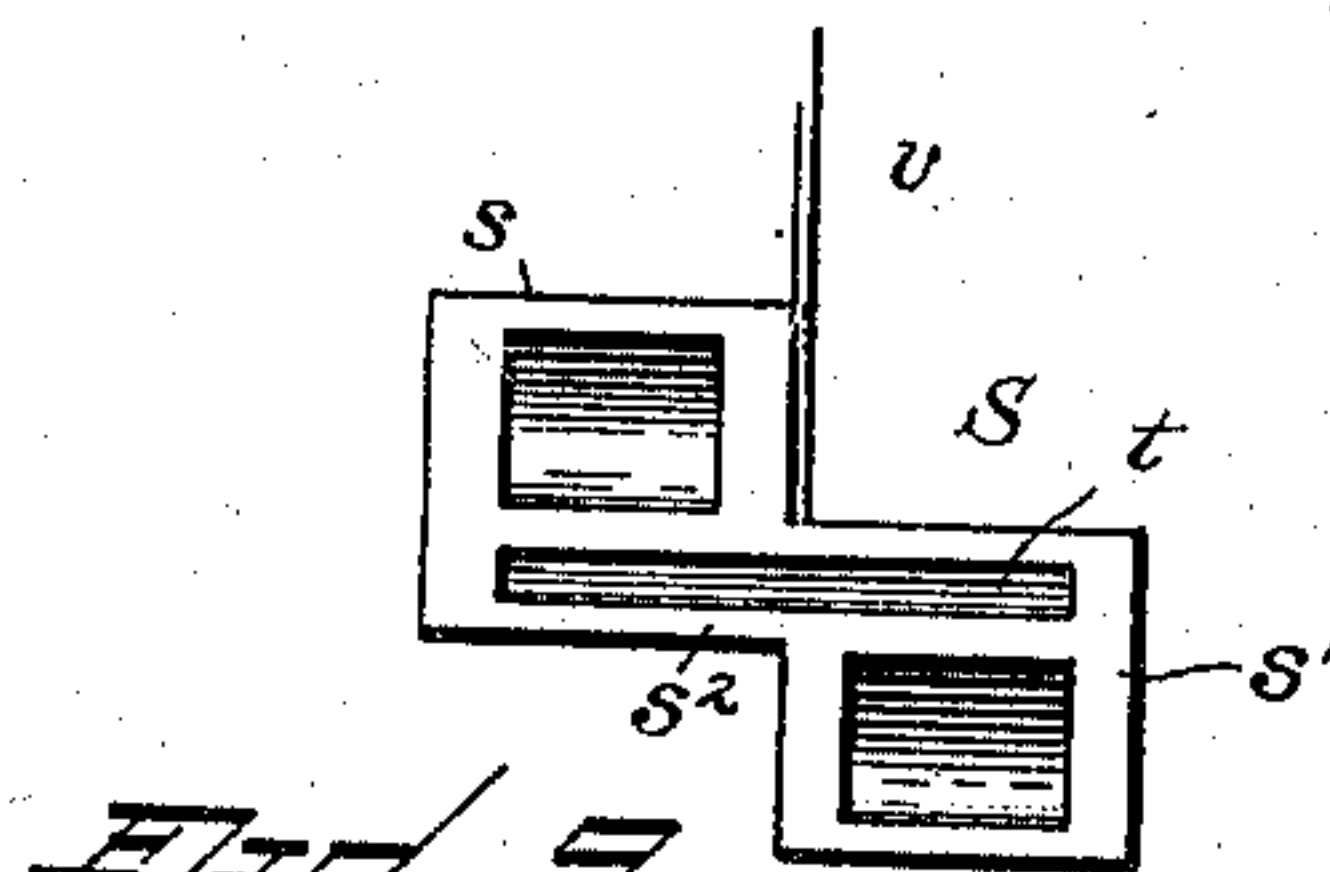
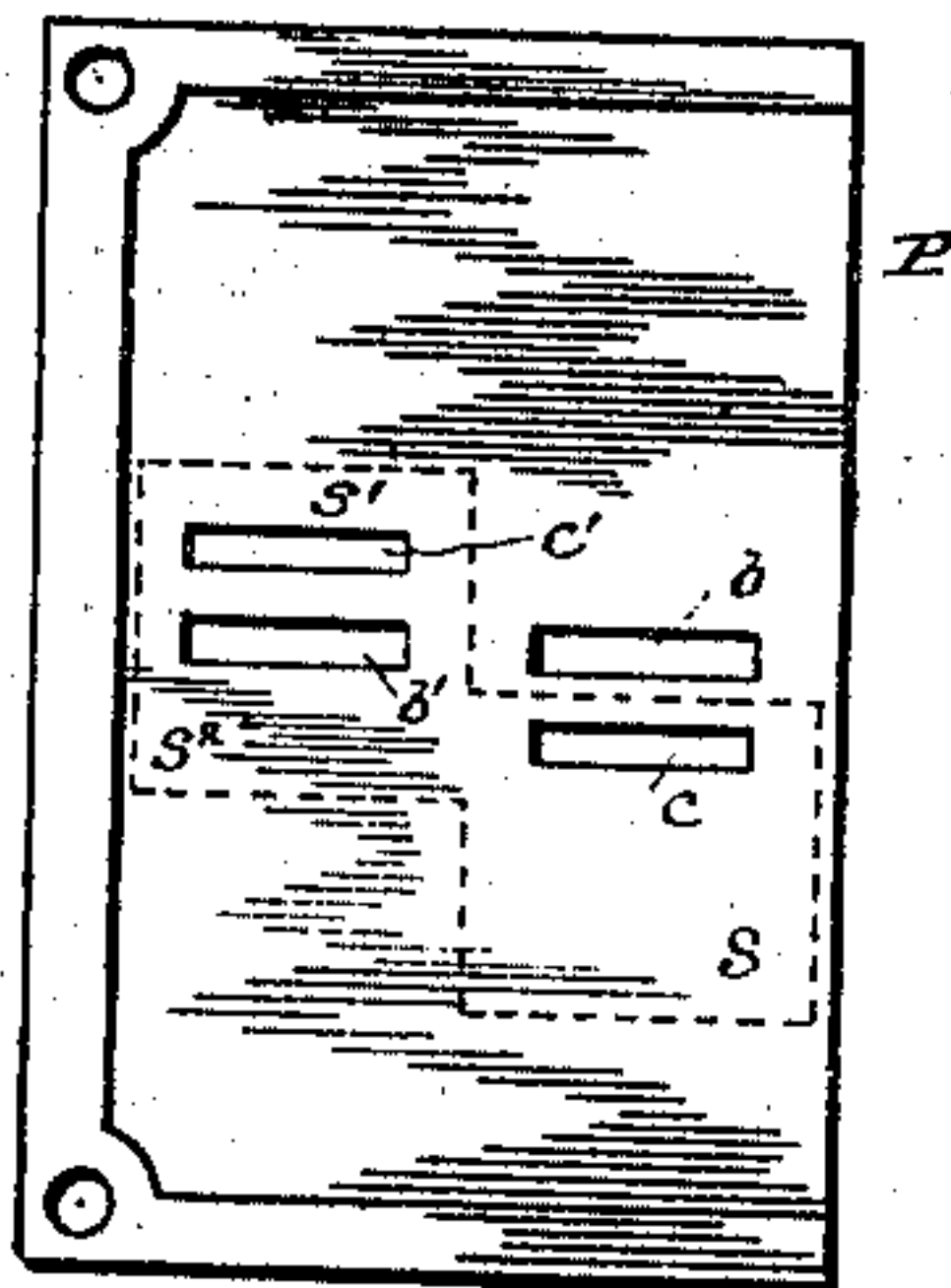
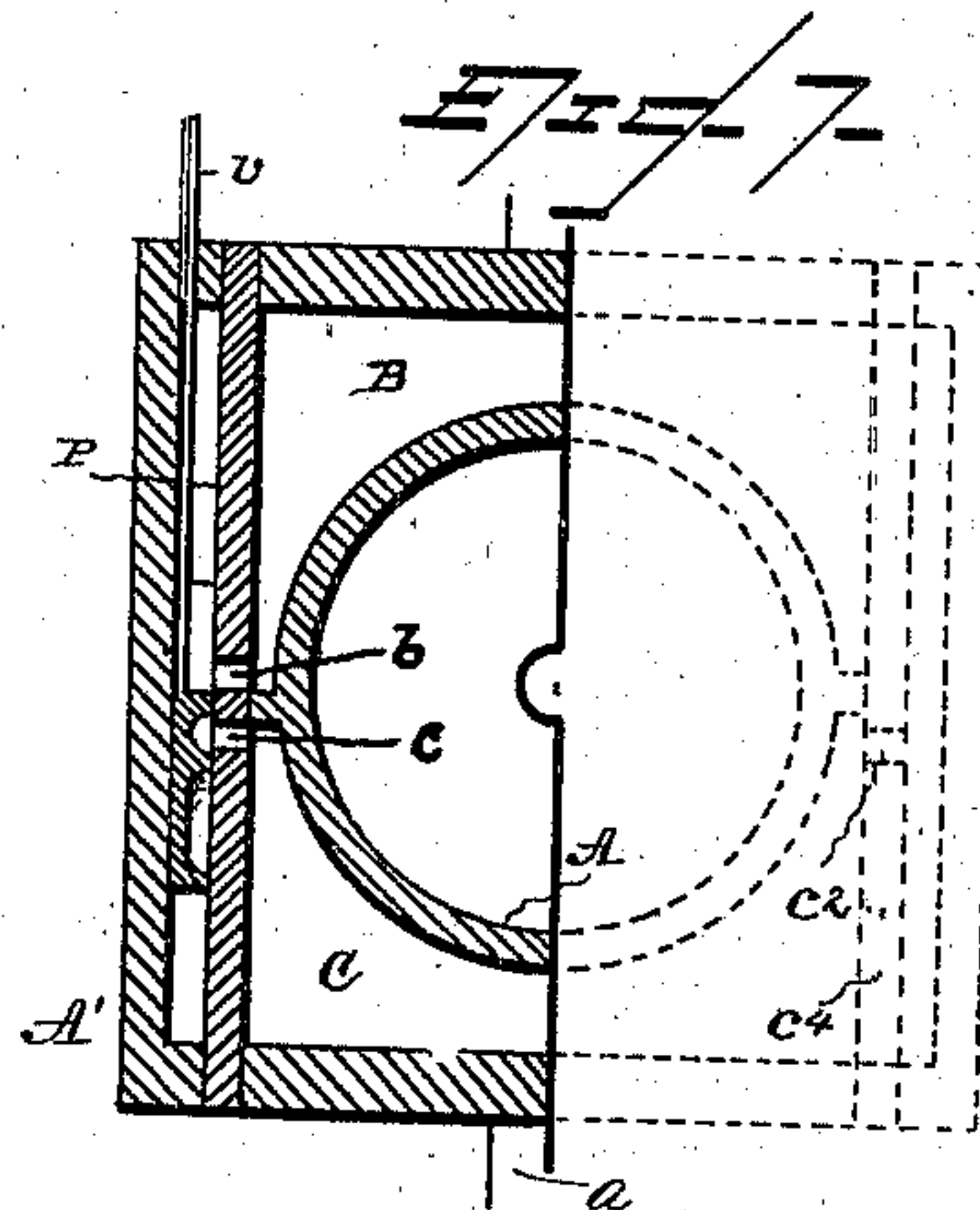
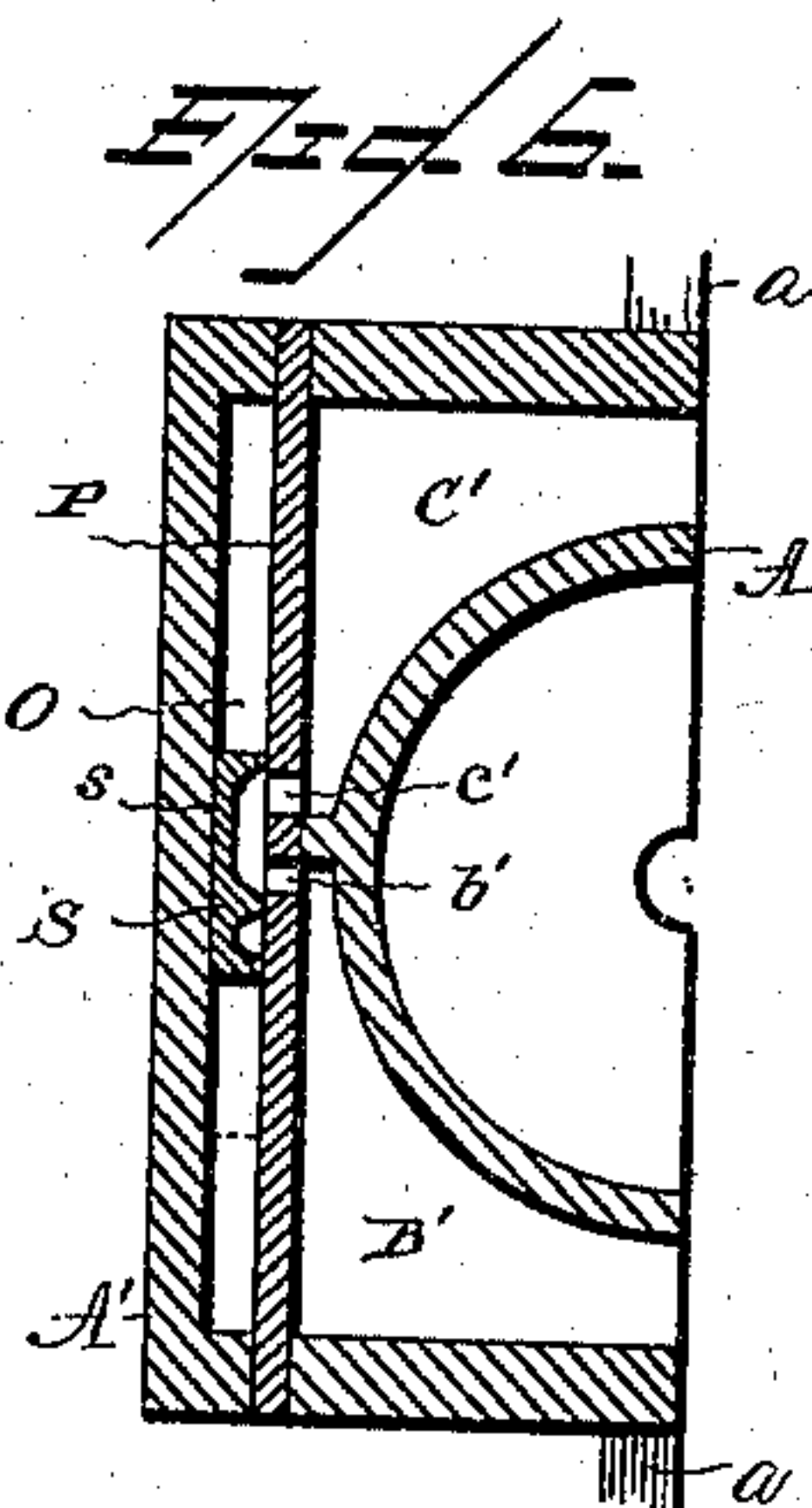
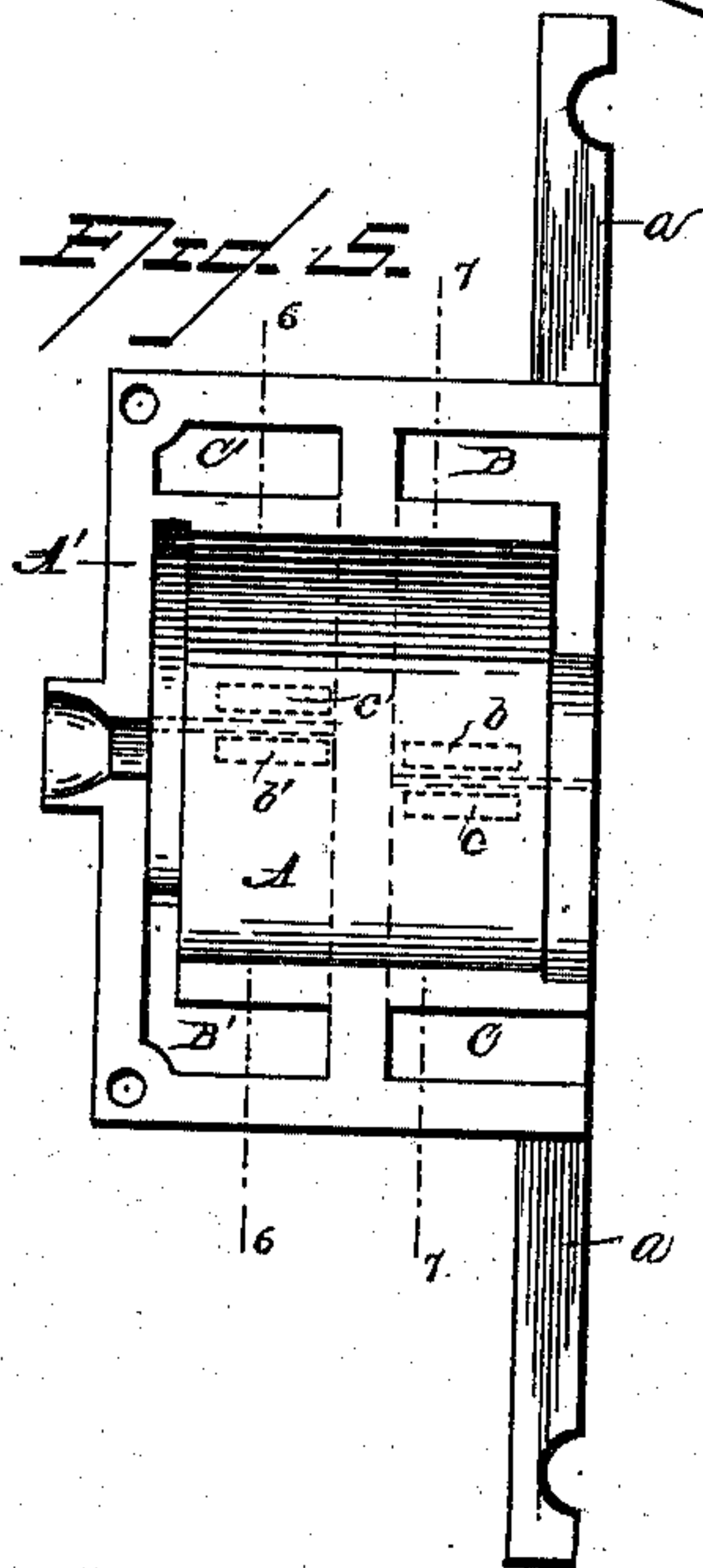
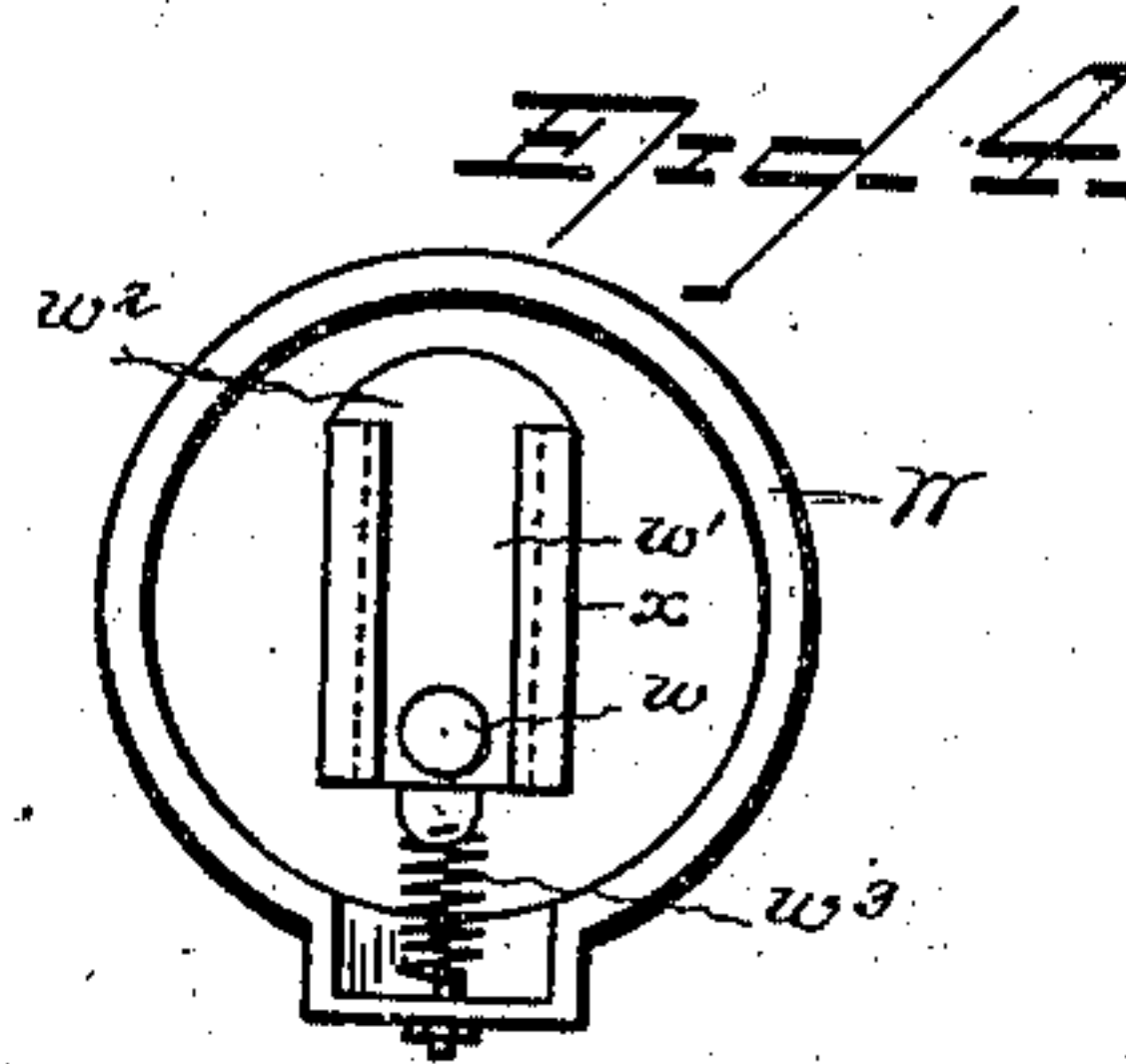
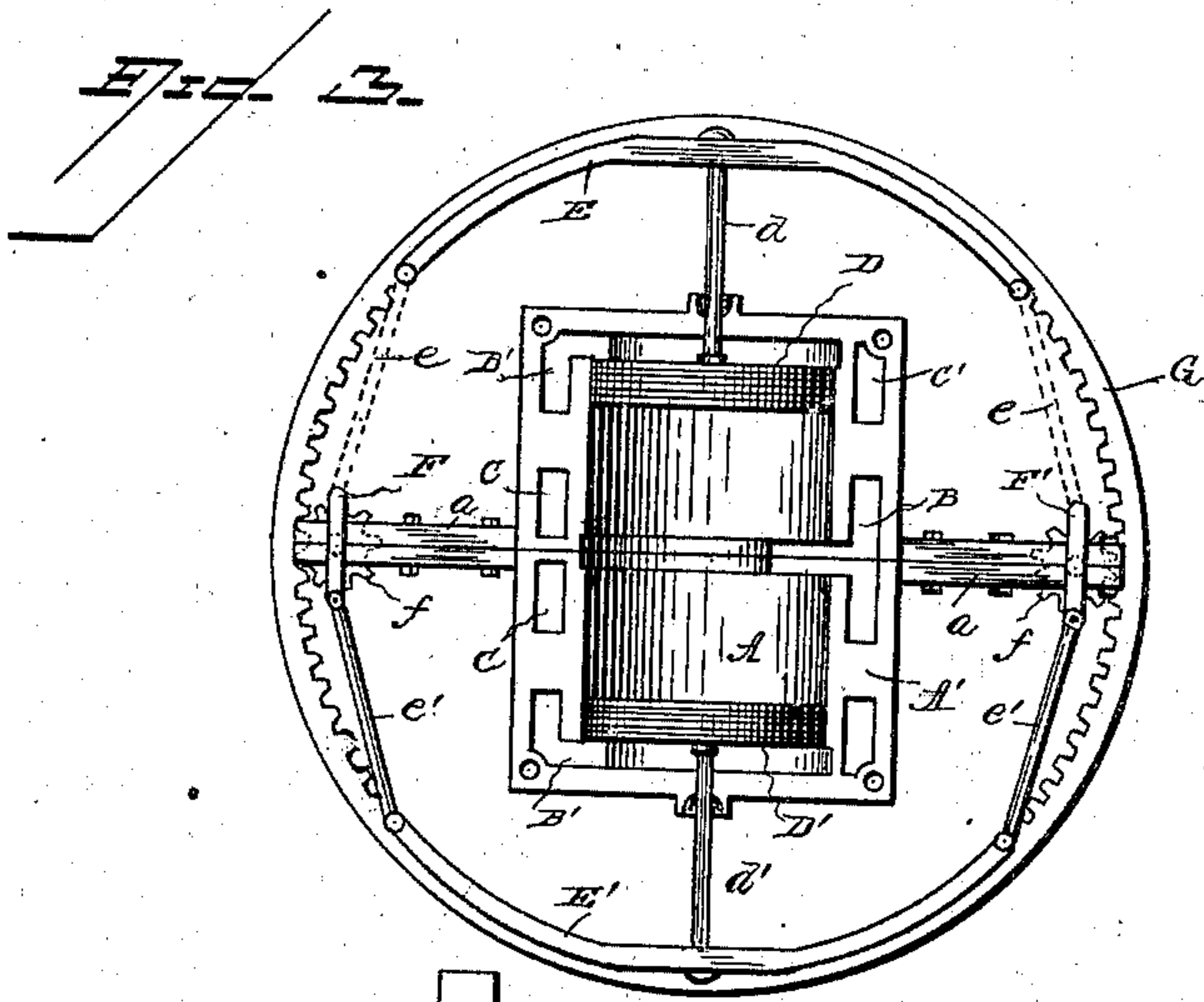
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(No Model.)

2 Sheets—Sheet 2.



Witnesses

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NICHOLAS J. VERRET AND HENRY N. SAMSTAG, OF LITTLE ROCK,
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STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 709,062, dated September 16, 1902.

Application filed August 10, 1901. Serial No. 71,556. (No model.)

To all whom it may concern:

Be it known that we, NICHOLAS J. VERRET and HENRY N. SAMSTAG, citizens of the United States, and residents of Little Rock, in the county of Pulaski and State of Arkansas, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

The primary object of the invention is to provide a steam-engine of such simple and compact construction that the operative parts are entirely inclosed within a tight casing that revolves with the cylinder, whereby to not only retain the heat within the engine, but also maintain a supply of oil to automatically lubricate the working parts or bearings.

A further object of the invention is to provide an engine in which the cylinder revolves and carries two pistons working in opposite directions and connected to crank-shafts having pinions in mesh with internal teeth on an annular ring, whereby the reciprocating motion of the pistons is converted into a rotary motion that is transmitted to the cylinder and parts carried thereby.

A further object of the invention is to provide an engine of this character with means by which the speed of the cylinder and shaft may be increased and diminished without changing the speed of the pistons.

A further object of the invention is to provide an engine of this character with peculiar valve mechanism by which the size of the port-openings is automatically regulated to govern the speed of the engine.

With the above objects in view the invention consists in the construction and arrangement of the parts of the engine and their combination, all as will be hereinafter fully described, and more specifically set forth in the appended claims.

In the drawings which form a part of this specification, Figure 1 is a side elevation of an engine constructed in accordance with our invention. Fig. 2 is a longitudinal sectional view. Fig. 3 is a transverse sectional view through the center of the cylinder. Fig. 4 is a detail view of the device for governing the movement of the slide-valve. Fig. 5 is a detail sectional view through a part of the cylinder. Fig. 6 is a sectional view on the

line 6 6, Fig. 5. Fig. 7 is a detail sectional view on the line 7 7 of Fig. 5. Fig. 8 is a detail view of the valve-seat. Fig. 9 is a detail view of the slide-valve.

Referring to said drawings, A designates the cylinder of the engine, which is inclosed within a rectangular steam-chest A', forming steam and exhaust passages B B' and C C', extending around the cylinder and arranged in the manner hereinafter described. The cylinder and steam-chest are formed in two parts securely bolted together, the bolts passing through the projections *a*, which provide the bearings for the crank-shafts.

Working in the cylinder A at opposite sides of the center thereof are two pistons D and D', which are actuated by steam-pressure admitted between said pistons and in the rear of the same alternately to reciprocate the pistons to and from each other. The piston-rods *d* and *d'* extend in opposite directions through the ends of the cylinder, and where said rods pass through the cylinder suitable packings are provided. The piston-rods are connected, respectively, to cross-heads E and E', and rods *e e* and *e' e'* are connected to the ends of said cross-heads and to crank-shafts F and F', the latter being located at opposite sides of the cylinder and extend at right angles to the pistons. Said crank-shafts are journaled in the bearings *a*, which project from the sides of the steam-chest. Each shaft has two crank portions projecting in opposite directions and connected to the cross-heads E and E', respectively, and as the movement of said cross-heads is to and from each other, corresponding with that of the pistons, the double crank equalizes the thrust motion in the driving of the shaft. Upon each shaft, at one end thereof, is mounted a pinion *f*, and said pinions are adapted to mesh with the internal teeth of a gear-ring G, secured to a flanged rim H. Over the flanged rim passes a friction-band I for holding the gear-ring stationary, so that the revolving pinions when in mesh with the teeth will be caused to travel within the ring and turn the cylinder and parts carried thereby. It will be here noted that by slacking up on the friction-band the gear-ring may be permitted to turn to a more or less extent, and thereby

reduce the speed of the revolving cylinder and shaft without changing the speed motion of the pistons, for the pinions will then turn the gear-ring and correspondingly reduce the speed of their forward travel. The particular construction of the engine, therefore, provides for a simple device for regulating the speed of the driving-shaft and quickly stopping the same. This is a feature peculiar to this engine and of particular importance in different fields of application of the engine.

M and M' designate the shafts upon which the combined cylinder and steam-chest are mounted, the said shafts passing into the opposite sides of the steam-chest and are secured thereto. These shafts are adapted to provide the means for feeding the live steam to the chest and the exhaust-steam therefrom, and to this end they are provided with a central bore, extending from their inner ends to globes or casings N and N', the globe N receiving steam from a boiler, while the globe N' has an exhaust-pipe connected thereto. The bores or steam-passages in the shafts open into the globes or casings through the sides of said shafts, as shown, and the globes are provided at each side with a suitable packing *n* to prevent the escape of steam. The live steam passes from the shaft M into a chamber O in the steam-chest and from said chamber through ports *b b'* in a valve-seat P to the steam-passages B and B', hereinbefore referred to, said valve-seat also having ports *c* and *c'*, which let into the exhaust-passages C and C' and provide for establishing communication between the steam and exhaust passages through the intervention of the slide-valve S. It will be noted that there is a set of steam and exhaust passages and a valve for each piston; but as they are alike a description of one will apply to the other, similar reference-letters being used on the drawings for both mechanisms. The arrangement of the passages will be understood by the drawings, the exhaust-passage C' being alongside the steam-passage B and at the outer side of the same, while the exhaust-passage C is at the inner side of the steam-passage B' and on a line with the passage B, so that passage B will exhaust into C and B' into C', the arrangement of passages also providing for passage B to enter the center of the cylinder at the inner side of the piston and passage B' to enter said cylinder at the outer end thereof or in the rear of the piston.

The slide-valve S is of peculiar construction to not only provide communication between the ports *b c* and *b' c'* alternately, but also between the ports *b* and *b'* during the intermediate travel of the valve. To this end the said slide-valve is formed with a block *s*, adapted to cover the ports *b* and *c*, a block *s'*, adapted to cover the ports *b'* and *c'*, and a connecting portion *s²* with a straight channel *t* to connect the ports *b* and *b'*. When the slide-valve has moved to cover the ports *b* and *c* to exhaust the steam from the inner

side of the piston, the port *b'* is open to admit steam through the passage B' to the rear side of said piston, and that when the valve has reached the limit of its movement in the other direction it will cover the ports *b'* and *c'* to exhaust the steam from behind the piston and open the port *b* to admit steam-pressure to the inner side of said piston. Also that during the intermediate movement of the valve in either direction the ports *b* and *b'* are connected, permitting the steam to revert back from one side of the piston to the other, preventing back pressure and giving an easy stroke to the piston. It will be further noted that the travel of the valve is at right angles to the travel of the pistons. This particular valve mechanism in addition to the advantages heretofore mentioned also possesses the feature of admitting the steam intermittently or during only a quarter of a revolution of the crank-shaft to which the piston is connected, the pressure being applied to give an impulse to the connecting-rods at the proper time or during the travel of the cranks above and below the axis of the shaft. The exhaust-passages C and C' communicate with the chamber which leads to the exhaust-pipe through openings *c²* and *c³* in a plate *c⁴*, Fig. 7.

The slide-valve S is operated by a rod *v*, connected to a wrist-wheel W on the end of the crank-shaft opposite the pinion. This wrist-wheel is provided with a movable pin *w*, to which the rod is connected and which regulates the movement of the valve, so that the size of the port-openings may be increased and diminished. The wrist-pin is on a plate *w'*, sliding between guides *x*, the said plate having a weight *w²* at one end and is connected to a spring *w³* at the other end. The weight is located on the opposite side of the axis of the wheel from the pin, so that the movement of the plate by centrifugal force will reduce the stroke of the rod, and consequently the movement of the slide-valve, so that the port-opening or steam-inlet will be only partly uncovered. This provides a very simple and effective governor for the engine, and though this form of slide-valve and operating mechanism is particularly adapted for application to the engine herein shown and described they could be readily applied to other styles of engines.

The construction and operation of our improved steam-engine will be readily understood from the foregoing description in connection with the accompanying drawings, for the reciprocations of the pistons in opposite directions—that is, to and from each other—will transmit a similar movement to the cross-heads, and said cross-heads being connected to the crank-shafts will revolve the same, so that the pinions on said shafts traveling within the gear-ring will turn the cylinder upon its axis, the valve mechanism of the cylinder operating in the manner hereinbefore described. Should the engine stop on a dead-

center, the gear-ring is turned in starting the engine again. By holding the cylinder stationary the gear-ring may be caused to revolve and the power of the engine may be taken from said gear-ring instead of from the shafts M and M'. The shafts M and M' are provided with band wheels or pulleys X, as shown.

The working parts of the engine are inclosed within a tight casing Y, consisting of the heads *y y* and cylinder *y'*, bolted together. This casing serves to retain the heat within the engine and being supplied with lubricating-oil will serve to lubricate the bearings continuously, the oil being used over and over again.

An engine of the construction herein shown and described will be not only compact, but will apply the power directly to the driving-shafts.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a steam-engine, the combination, of a cylinder, shafts connected to said cylinder, pistons working in the cylinder, pinions geared to said pistons, a gear-wheel over which the pinions travel, and means for regulating the turning of the gear-wheel and holding it stationary, substantially as shown and described.

2. In a steam-engine, the combination, of the cylinder, shafts connected to the sides of said cylinder, pinions geared to the pistons of the cylinder, a gear-wheel over which the pinions travel, and a friction-band engaging said gear-wheel; together with valve mechanism for the cylinder, substantially as shown and described.

3. In a steam-engine, the combination, of the cylinder, shafts connected to the sides of the cylinder, pistons working in the cylinder in opposite directions with their piston-rods projecting through the ends of the cylinder, cross-heads connected to the ends of the piston-rods, double-crank shafts connected to the cross-heads, pinions on the crank-shafts, a gear-wheel over which the pinions travel, and means for holding said gear-wheel stationary, substantially as shown and described.

4. In a steam-engine, the combination, of the cylinder, shafts connected to the sides of the cylinder, pistons working in the cylinder,

cross-heads connected to the ends of the piston-rods, crank-shafts mounted on the cylinder and connected to the cross-heads, pinions on the crank-shafts, a gear-wheel over which the pinions travel and a brake for said gear-wheel, substantially as shown and described.

5. In a steam-engine, the combination, of the cylinder, shafts connected to the sides of the cylinder, pistons working in the cylinder, cross-heads connected to the ends of the piston-rods, double-crank shafts to which the cross-heads are connected, pinions on said shafts, a gear-wheel over which the pinions travel, and a friction-band engaging said gear-wheel, substantially as shown and described.

6. In a steam-engine, the combination, of the cylinder, shafts connected to the sides of the cylinder, pistons working in the cylinder, crank-shafts mounted on the cylinder and connected to the piston-rods, pinions on said crank-shafts, and a gear-wheel over which the pinions travel; together with means for holding the gear-wheel stationary, substantially as shown and described.

7. In a steam-engine, the combination, of the cylinder, shafts connected to the sides of said cylinder, pistons working in the cylinder, double-crank shafts mounted on the cylinder, cross-heads attached to the piston-rods and connected to the double crank-shafts, pinions on said crank-shafts, a gear-wheel over which the pinions travel, and a friction device engaging the gear-wheel, substantially as shown and described.

8. In a steam-engine, the combination, of the cylinder having steam and exhaust passages around the same, hollow shafts connected to the sides of the cylinder to conduct the steam to and from the same, and slide-valves through which the steam is admitted to and from the cylinder; together with the pistons, crank-shafts connected to the piston-rods, pinions on said crank-shafts, and a stationary gear-wheel over which the pinions travel, substantially as shown and described.

In testimony whereof we affix our signatures in the presence of two witnesses.

NICHOLAS J. VERRET.
HENRY N. SAMSTAG.

Witnesses:

F. M. FULK,
F. GUY FULK.